

RESOLVING NEW KEYNESIAN ANOMALIES WITH WEALTH IN THE UTILITY FUNCTION

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Review of Economics and Statistics, 2021

Paper available at <https://www.pascalmichailat.org/11.html>

ANOMALIES IN NK MODEL AT ZLB

1. collapse of output & inflation
 - Eggertsson, Woodford [2004]
 - Werning [2011]
2. implausibly large effects of forward guidance
 - del Negro, Giannoni, Patterson [2015]
 - Cochrane [2017]
3. implausibly large effects of government spending
 - Christiano, Eichenbaum, Rebelo [2011]
 - Cochrane [2017]

EXISTING REMEDIES TO ZLB ANOMALIES

- Cochrane [2018]: fiscal theory of price level
- Bilbiie [2018] & Acharya, Dogra [2020]: heterogeneous agents
- Gabaix [2020]: bounded rationality
- Diba, Loisel [2021]: interest on bank reserves
- but these remedies complicate the textbook model
 - sometimes equilibrium system becomes 3-dimensional
 - sometimes derivations are complicated by heterogeneity or bounded rationality

THIS PAPER: MINIMAL DEVIATION FROM TEXTBOOK

- New Keynesian model with relative wealth in the utility function
- only one additional parameter
 - marginal utility of wealth in Euler equation

⇒ equilibrium system remains 2-dimensional

- 2 variables: output & inflation
- 2 differential equations: Euler equation & Phillips curve

⇒ derivations remain exactly the same

WHY WOULD PEOPLE VALUE WEALTH IN ITSELF?

- Keynes [1919]: “The duty of saving became nine-tenths of virtue and the growth of the cake the object of true religion.... Saving was for old age or for your children; but **this was only in theory**—the virtue of the cake was that it was never to be consumed, neither by you nor by your children after you.”
- Irving Fisher [1930]: “A man may include in the benefits of his wealth... the **social standing** he thinks it gives him, or political power and influence, or the mere miserly sense of possession, or the satisfaction in the mere process of further accumulation.”

WHY WOULD PEOPLE VALUE WEALTH IN ITSELF?

- Camerer, Loewenstein, Prelec [2005]: “brain-scans conducted while people win or lose money suggest that money activates similar reward areas as do other **primary reinforcers** like food and drugs, which implies that money confers direct utility, rather than simply being valued only for what it can buy.”
- evidence from economics, social psychology, sociology, social neuroscience: wealth is a **marker of social status**, and people value high social status

NK MODEL WITH WEALTH IN THE UTILITY

- self-employed household $j \in [0, 1]$ maximizes utility

$$\int_0^\infty e^{-\delta t} \left[\ln(c_j(t)) + u \left(\frac{b_j(t)}{p(t)} - \frac{b(t)}{p(t)} \right) - \kappa h_j(t) - \frac{\gamma}{2} \pi_j(t)^2 \right] dt$$

- consumption index: $c_j(t) = \left[\int_0^1 c_{jk}(t)^{(\epsilon-1)/\epsilon} dk \right]^{\epsilon/(\epsilon-1)}$
 - aggregate wealth: $b(t) = \int_0^1 b_j(t) dj$
 - inflation: $\pi_j(t) = \dot{p}_j(t)/p_j(t)$
- subject to budget constraint:

$$\dot{b}_j(t) = i(t)b_j(t) + p_j(t)y_j(t) - \int_0^1 p_k(t)c_{jk}(t) dk$$

- to production function: $y_j(t) = ah_j(t)$
- to demand for good i : $y_j(t) = \left[p_j(t)/p(t) \right]^{-\epsilon} c(t)$

EQUILIBRIUM: EULER-PHILLIPS SYSTEM

- Phillips curve: standard

$$\dot{\pi} = \delta\pi - \frac{\epsilon\kappa}{\gamma a} (y - y^n) \quad \text{with} \quad y^n = \frac{\epsilon - 1}{\epsilon} \cdot \frac{a}{\kappa}$$

- Euler equation: “discounted”

$$\frac{\dot{y}}{y} = r(\pi) + u'(0)y - \delta$$

- financial returns: real interest rate = $r(\pi) = i(\pi) - \pi$
- hedonic returns: $\text{MRS}(\text{wealth}, \text{consumption}) = u'(0)y^n$

so
$$\frac{\dot{y}}{y} = r(\pi) - r^n + u'(0)(y - y^n) \quad \text{with} \quad r^n = \delta - u'(0)y^n$$

TWO MODELS

- NK: standard New Keynesian model

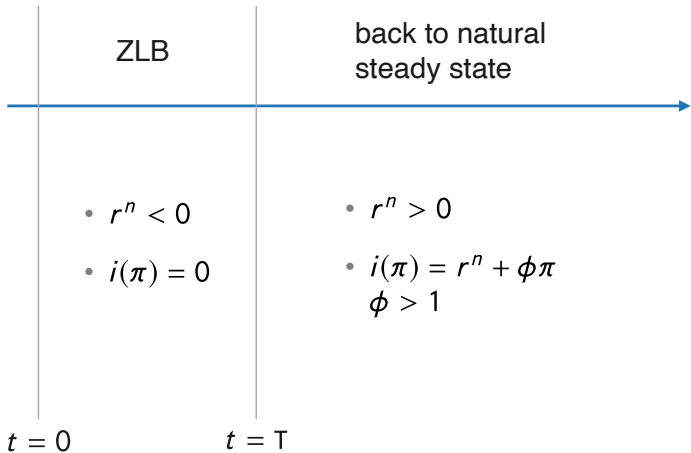
$$u'(0) = 0$$

- WUNK: wealth-in-the-utility New Keynesian model

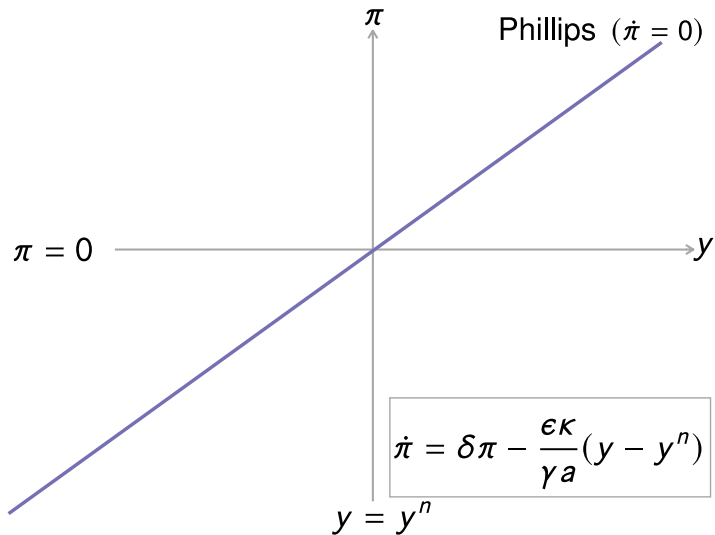
$$u'(0) > \frac{\epsilon_K}{\delta \gamma \alpha}$$

OUTPUT & INFLATION COLLAPSE

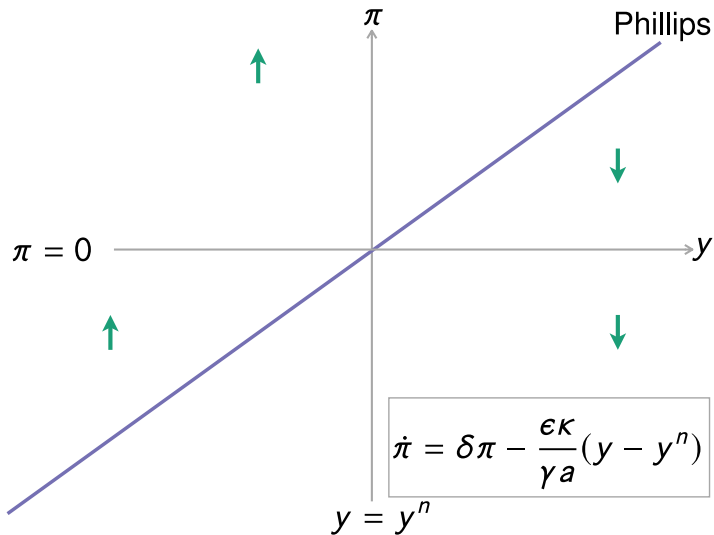
SCENARIO: ZLB



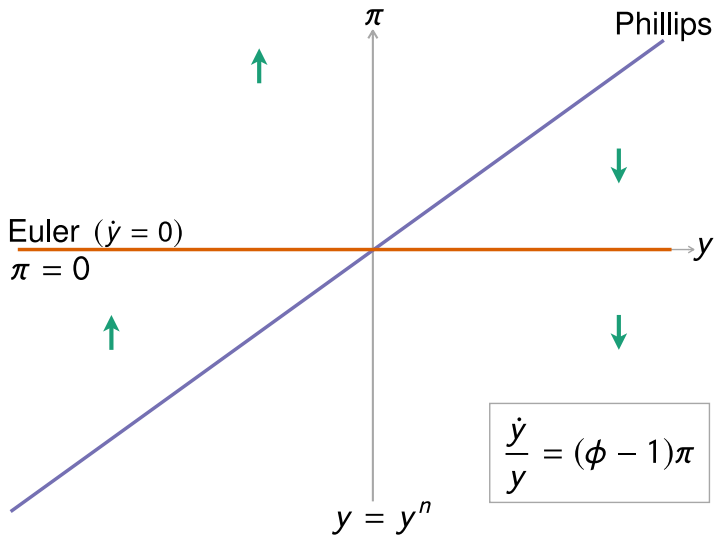
NK | PHASE DIAGRAM IN NORMAL TIMES



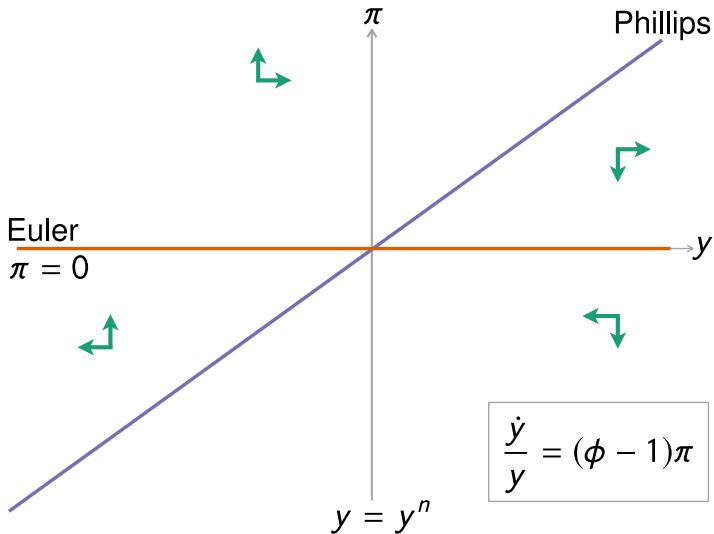
NK | PHASE DIAGRAM IN NORMAL TIMES



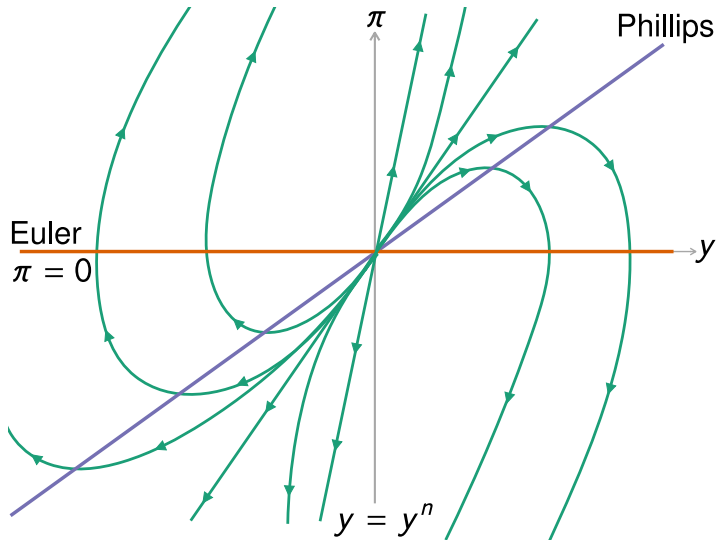
NK | PHASE DIAGRAM IN NORMAL TIMES



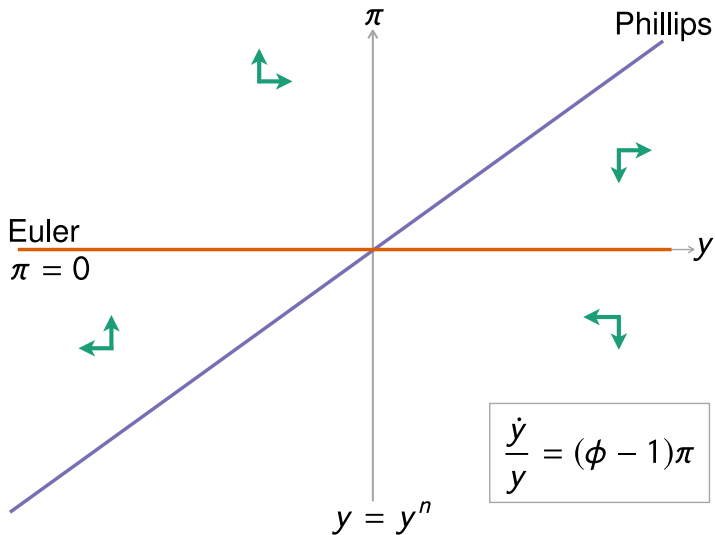
NK | PHASE DIAGRAM IN NORMAL TIMES



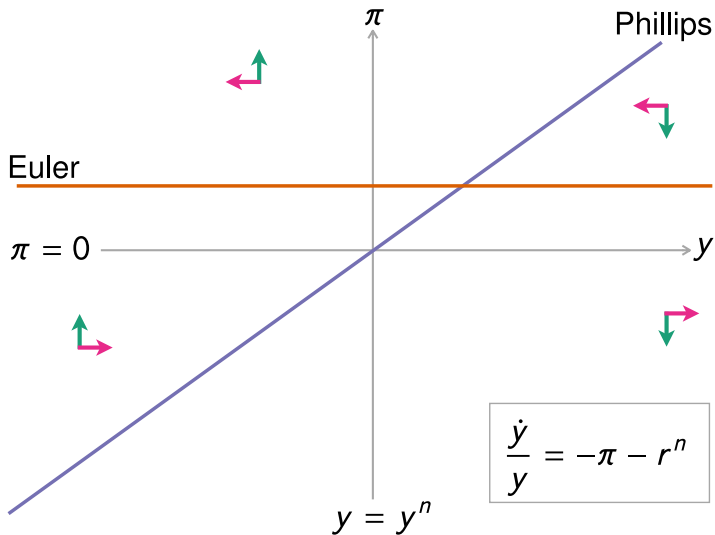
NK | PHASE DIAGRAM IN NORMAL TIMES: SOURCE



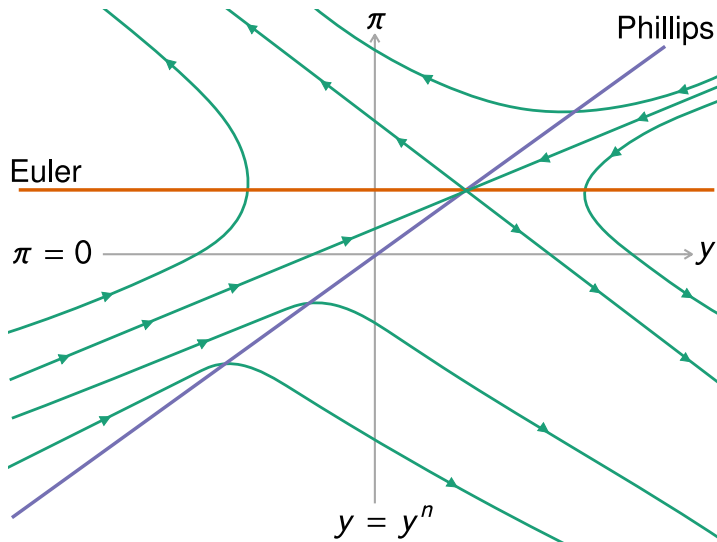
NK | PHASE DIAGRAM AT ZLB



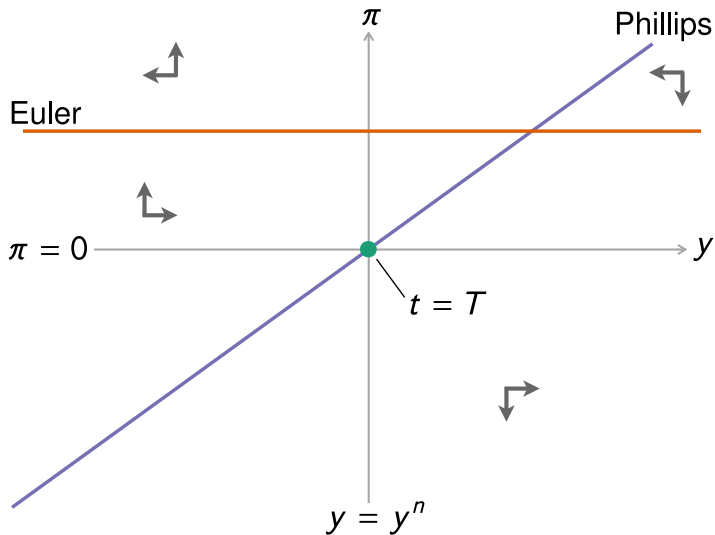
NK | PHASE DIAGRAM AT ZLB



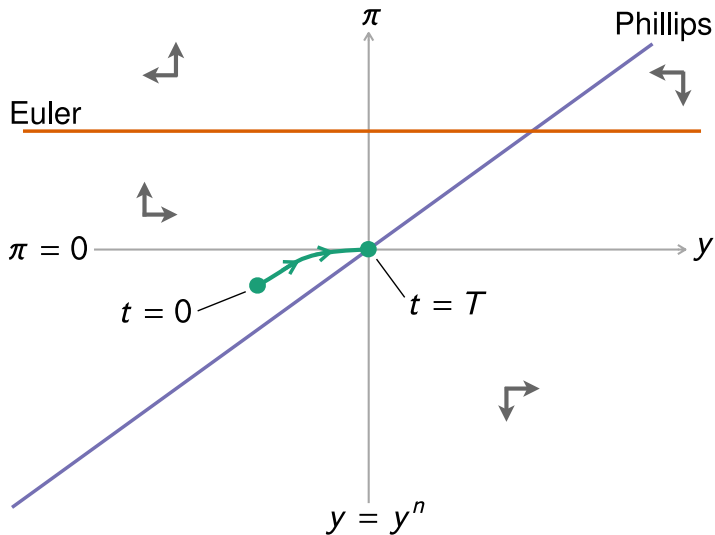
NK | PHASE DIAGRAM AT ZLB: SADDLE



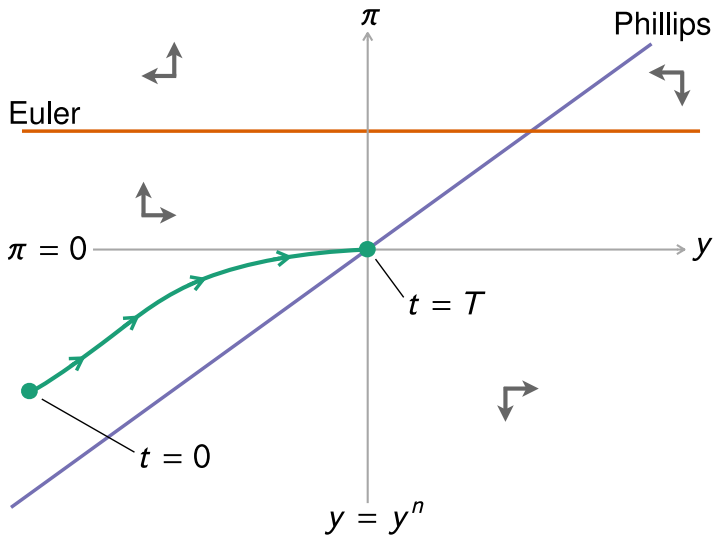
NK | ZLB EPISODE



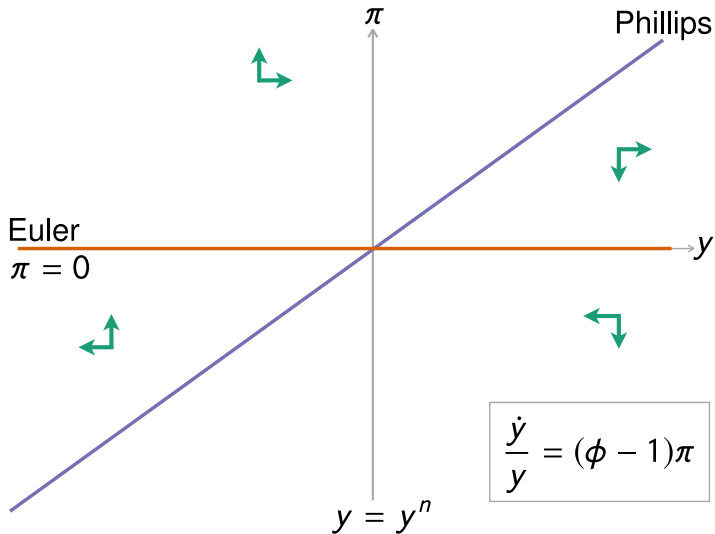
NK | ZLB EPISODE



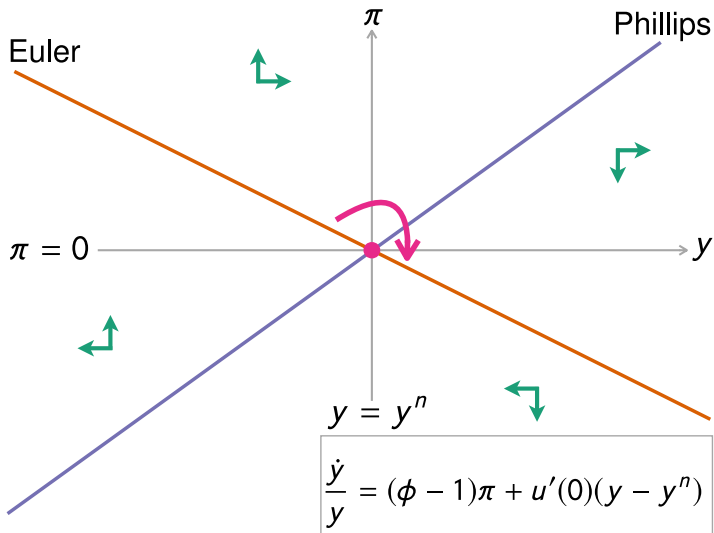
NK | LONGER ZLB: OUTPUT & INFLATION COLLAPSE



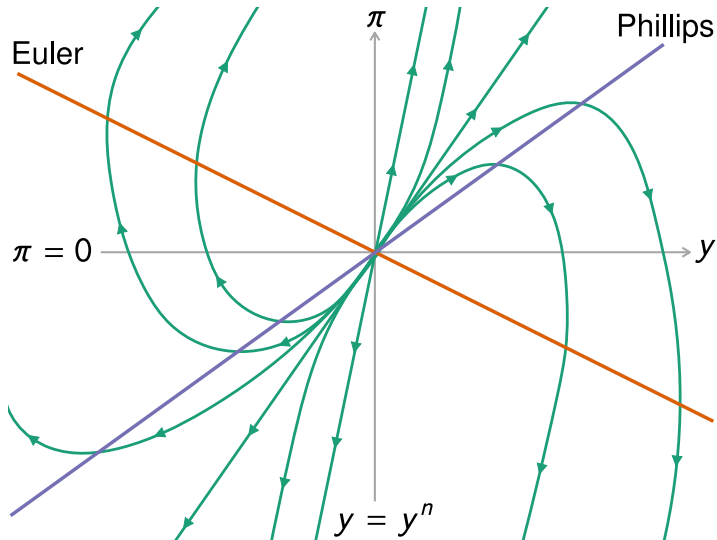
WUNK | PHASE DIAGRAM IN NORMAL TIMES



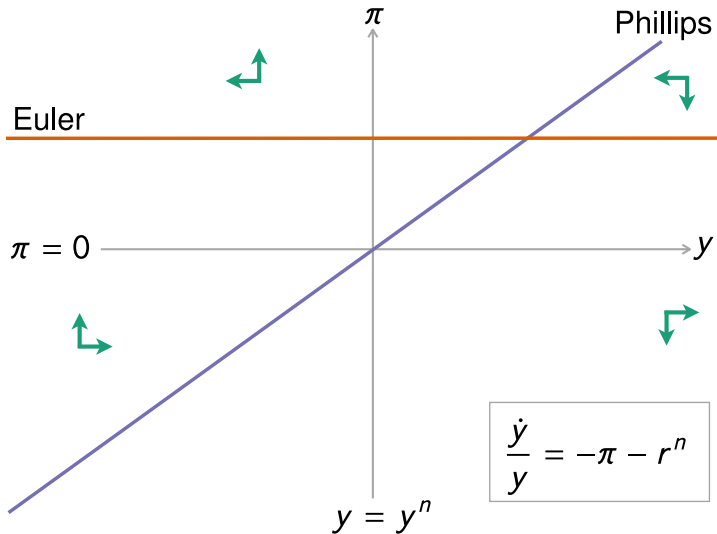
WUNK | PHASE DIAGRAM IN NORMAL TIMES



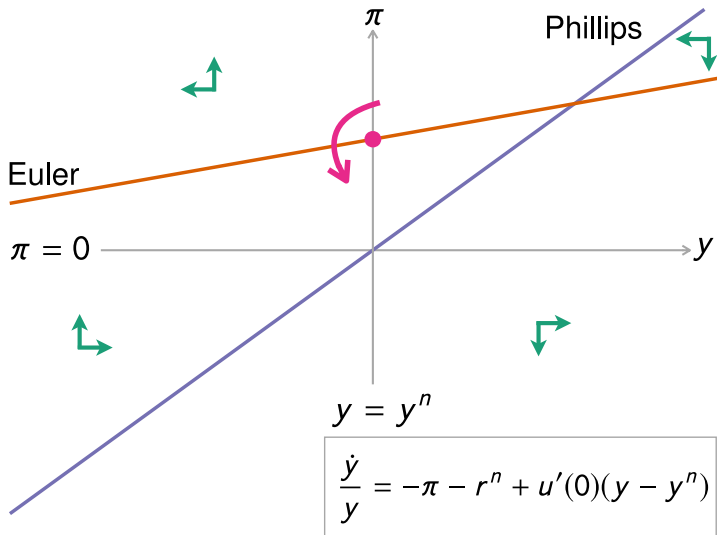
WUNK | PHASE DIAGRAM IN NORMAL TIMES: SOURCE



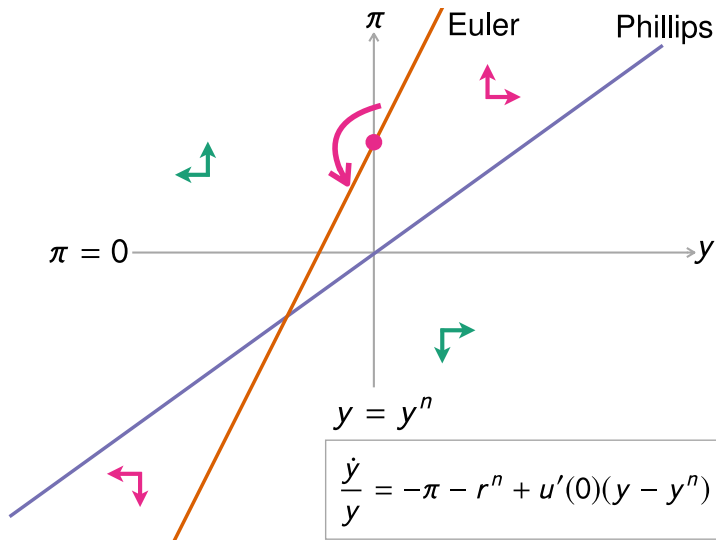
WUNK | PHASE DIAGRAM AT ZLB



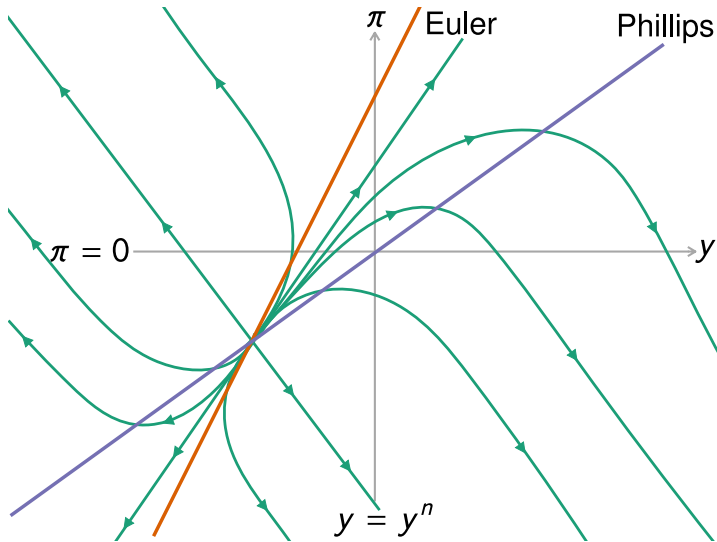
WUNK | PHASE DIAGRAM AT ZLB



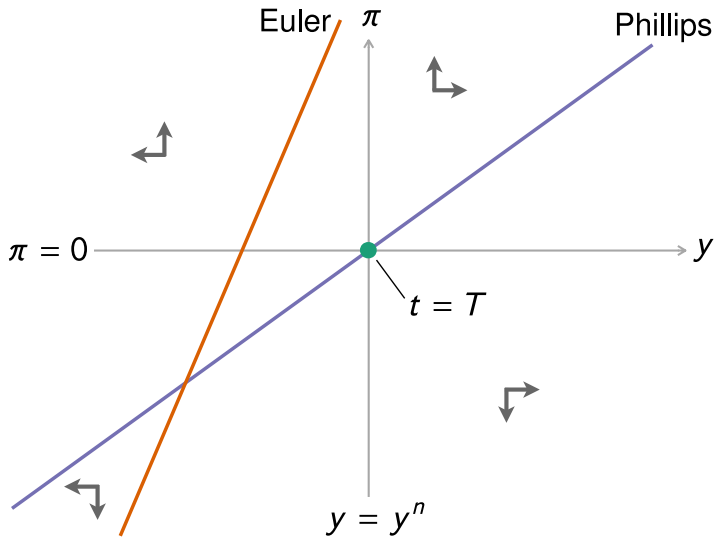
WUNK | PHASE DIAGRAM AT ZLB



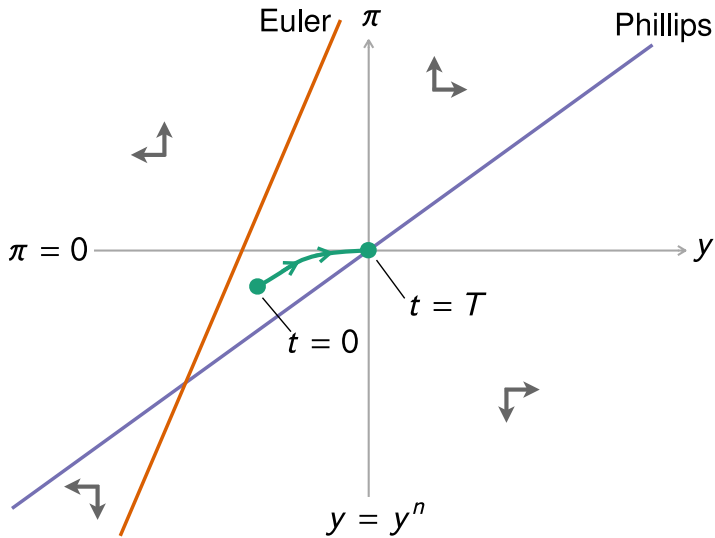
WUNK | PHASE DIAGRAM AT ZLB: SOURCE



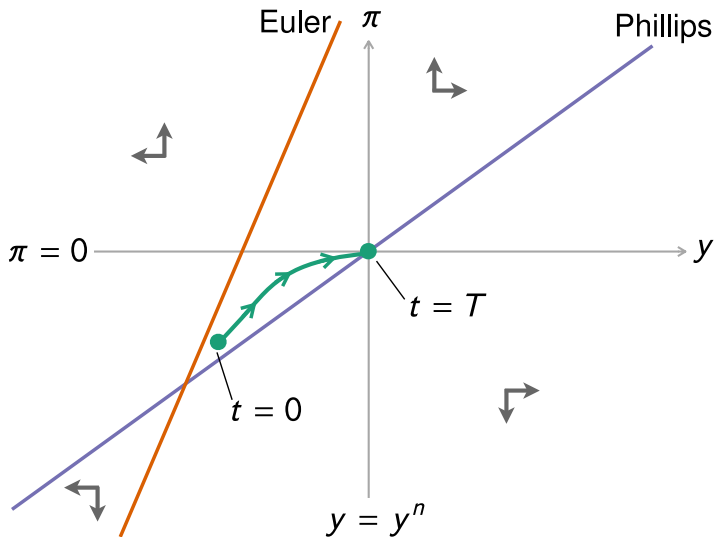
WUNK | ZLB EPISODE



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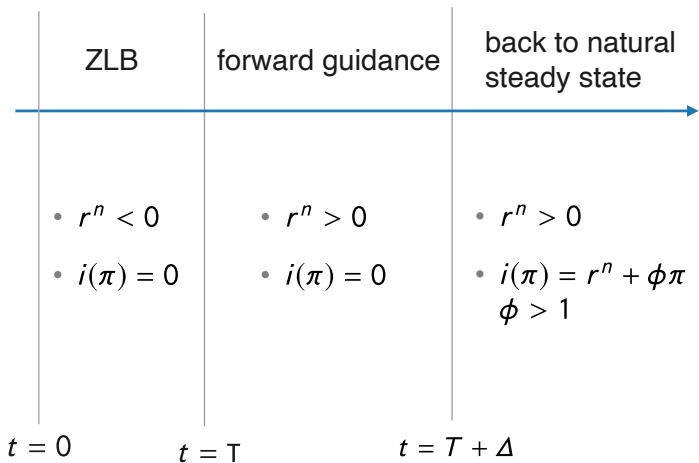


WUNK | LONGER ZLB CONVERGES TO STEADY STATE

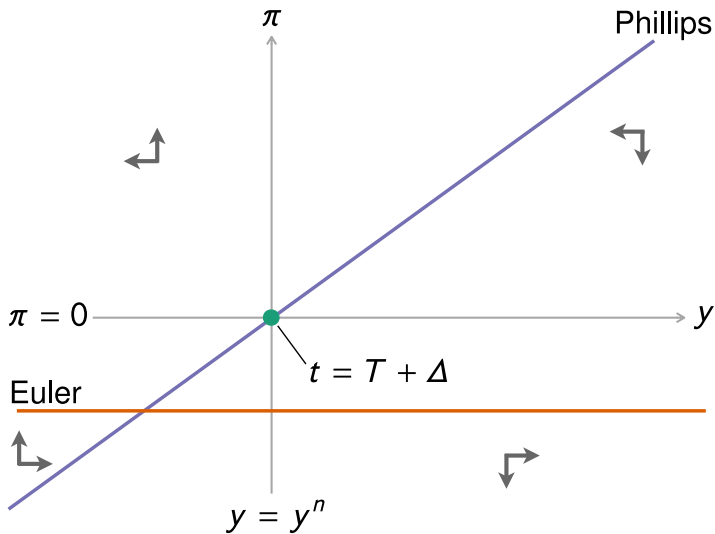


FORWARD GUIDANCE

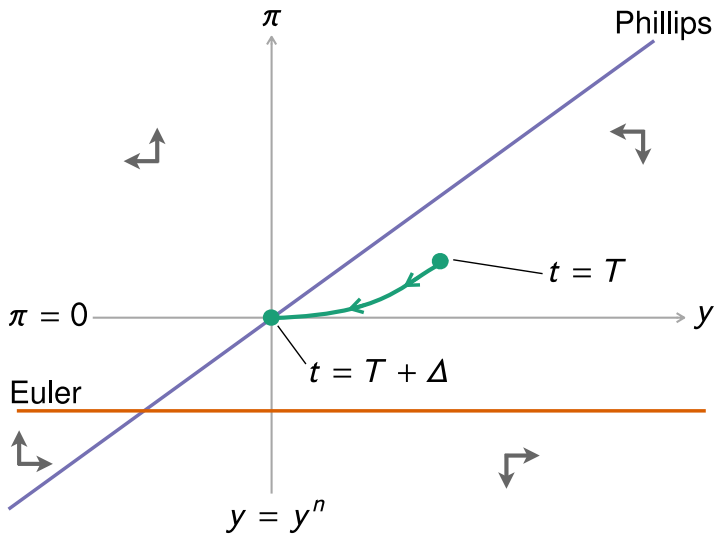
SCENARIO: ZLB + FORWARD GUIDANCE



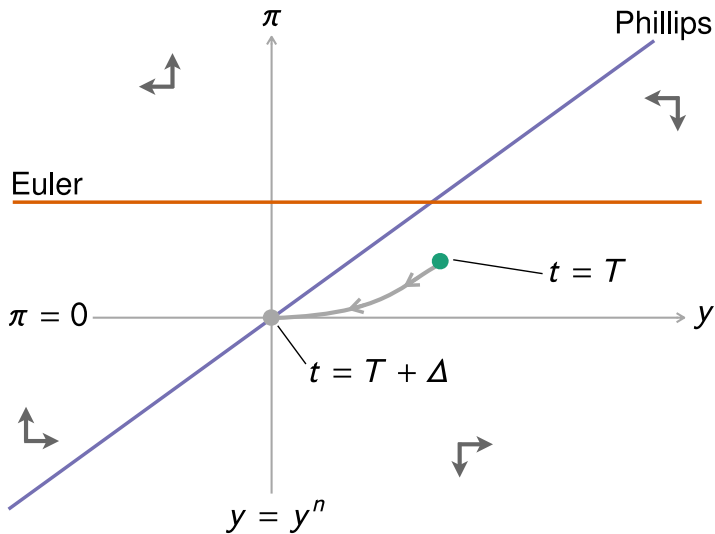
NK | ZLB + **FORWARD GUIDANCE**



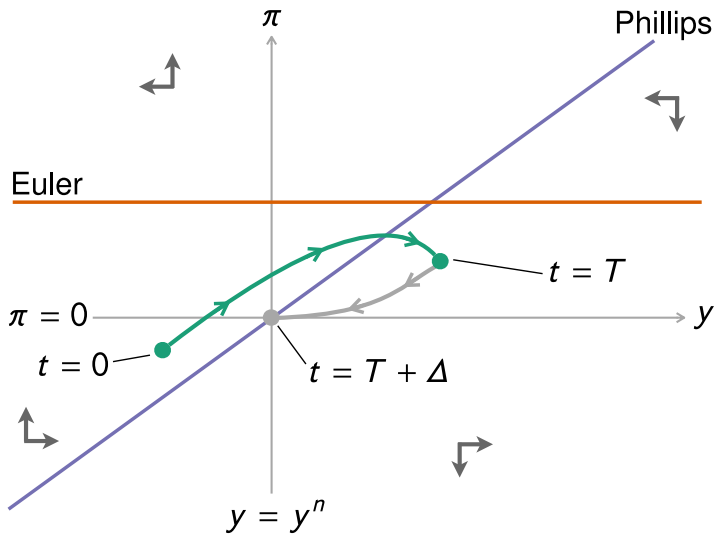
NK | ZLB + **FORWARD GUIDANCE**



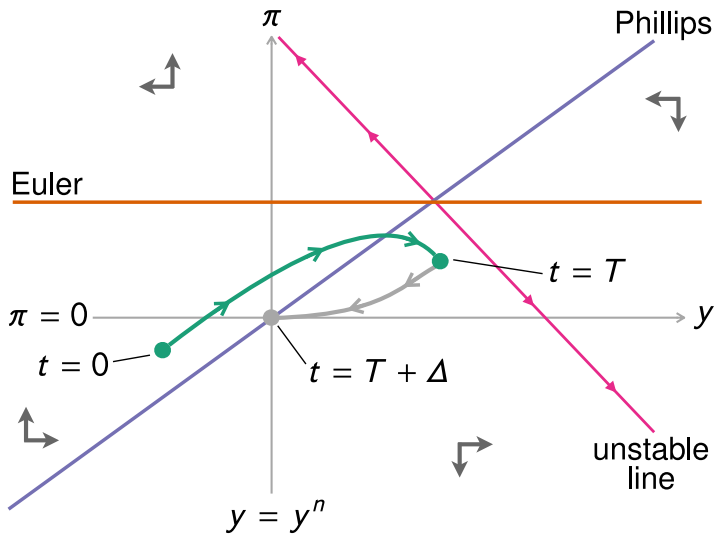
NK | **ZLB** + FORWARD GUIDANCE



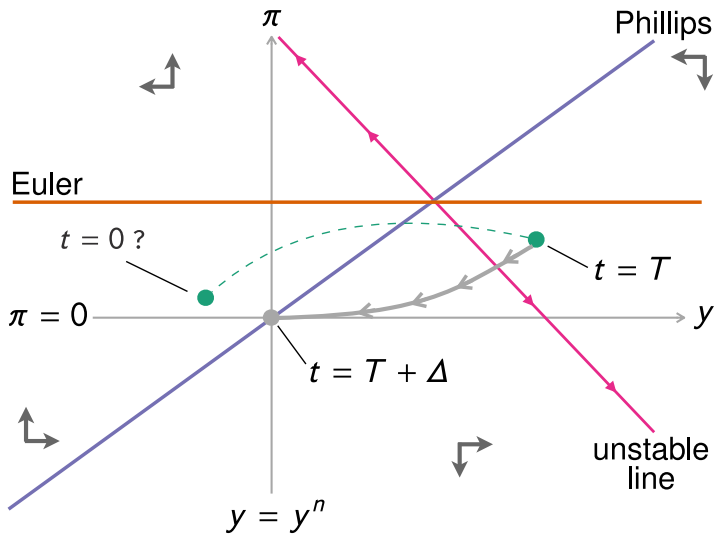
NK | **ZLB** + FORWARD GUIDANCE



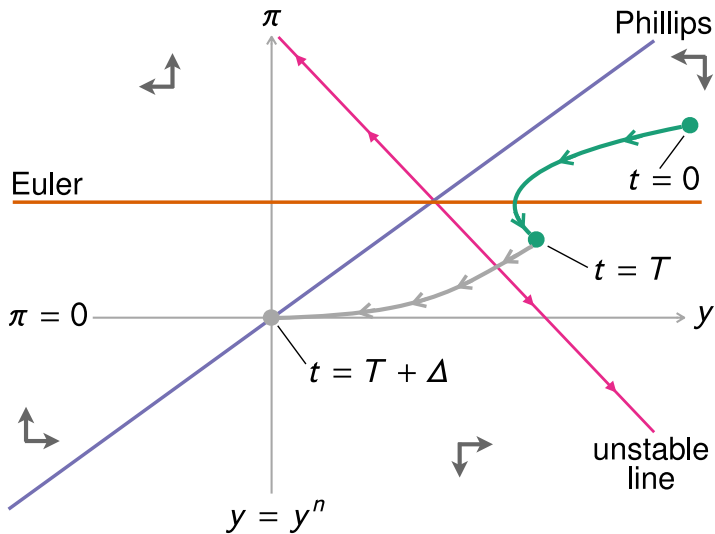
NK | LONGER GUIDANCE: BOOM AT ZLB



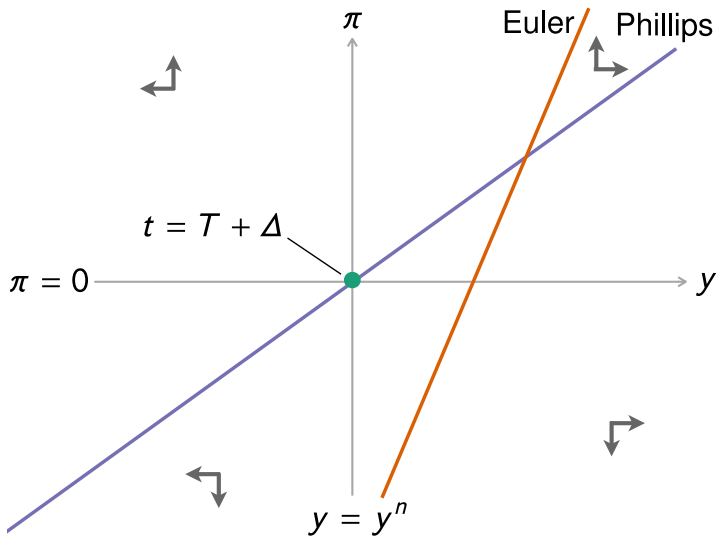
NK | LONGER GUIDANCE: BOOM AT ZLB



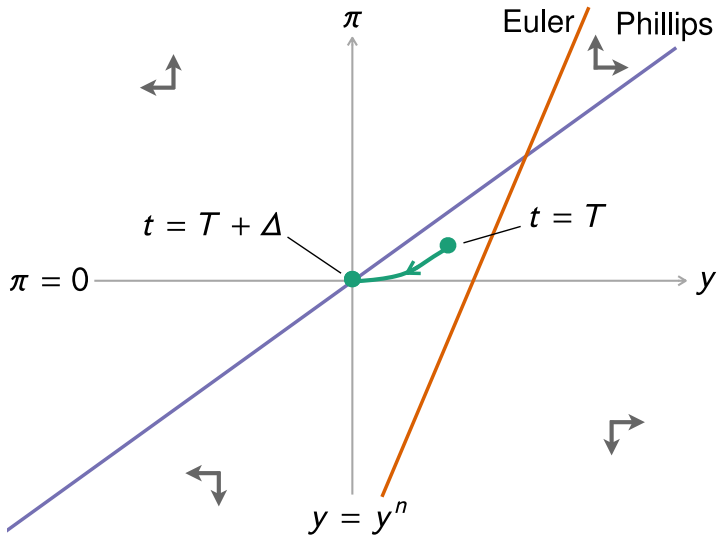
NK | LONGER GUIDANCE: BOOM AT ZLB



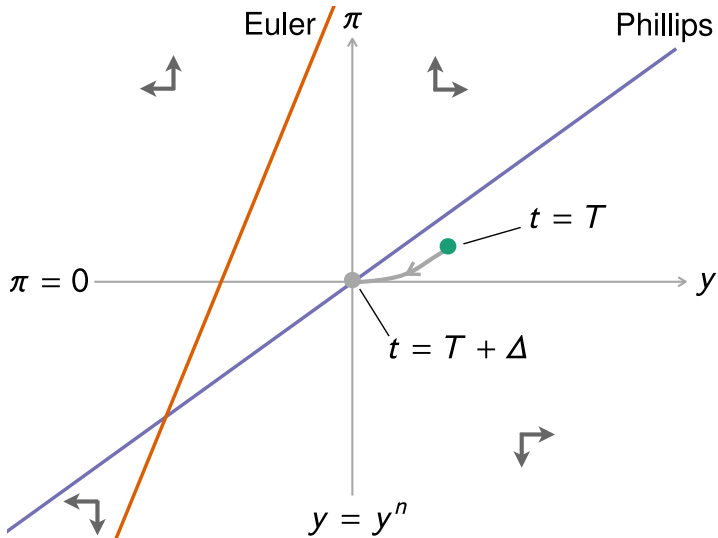
WUNK | ZLB + **FORWARD GUIDANCE**



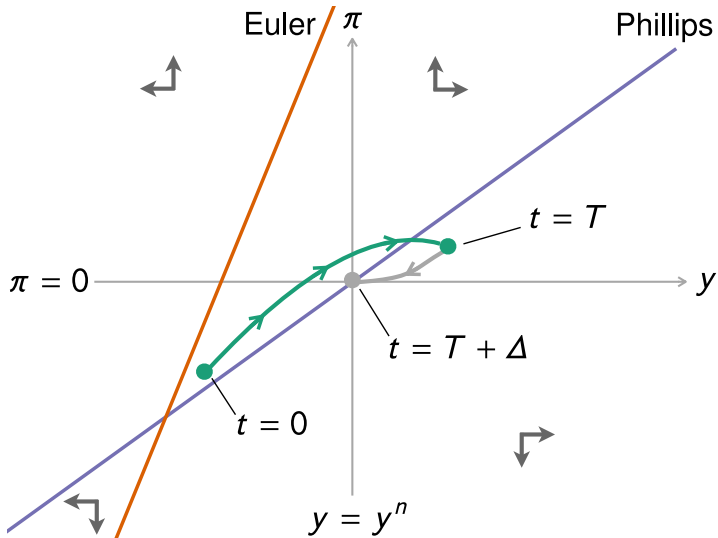
WUNK | ZLB + **FORWARD GUIDANCE**



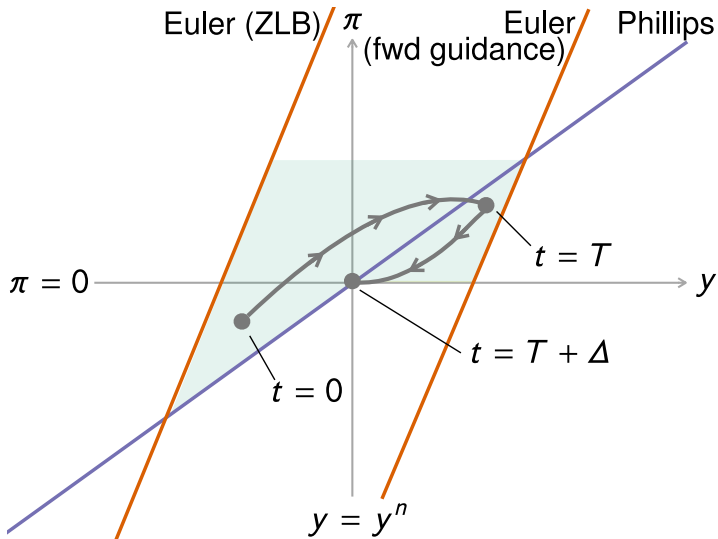
WUNK | **ZLB** + FORWARD GUIDANCE



WUNK | **ZLB** + FORWARD GUIDANCE

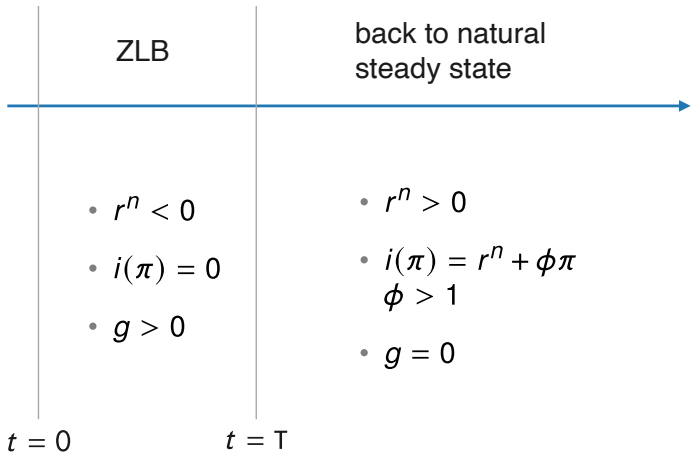


WUNK | LONGER GUIDANCE: LIMITED EFFECT

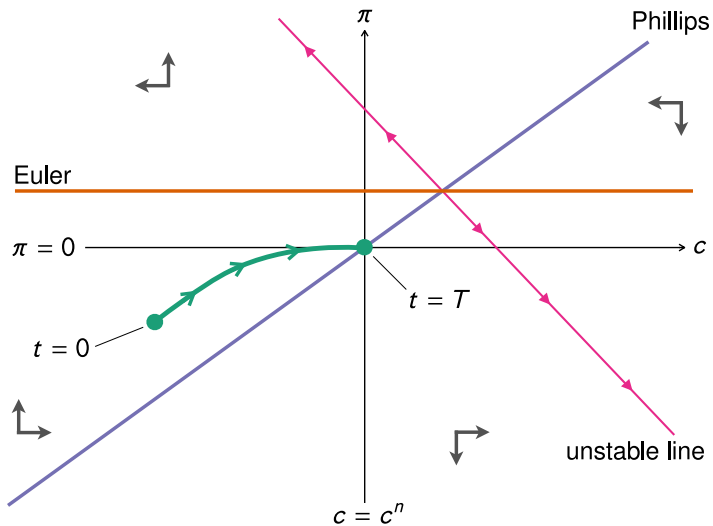


GOVERNMENT SPENDING

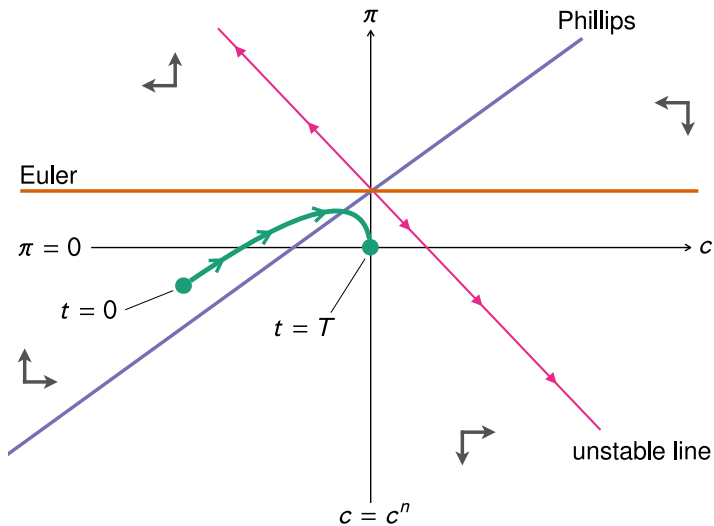
SCENARIO: ZLB + GOVERNMENT SPENDING g



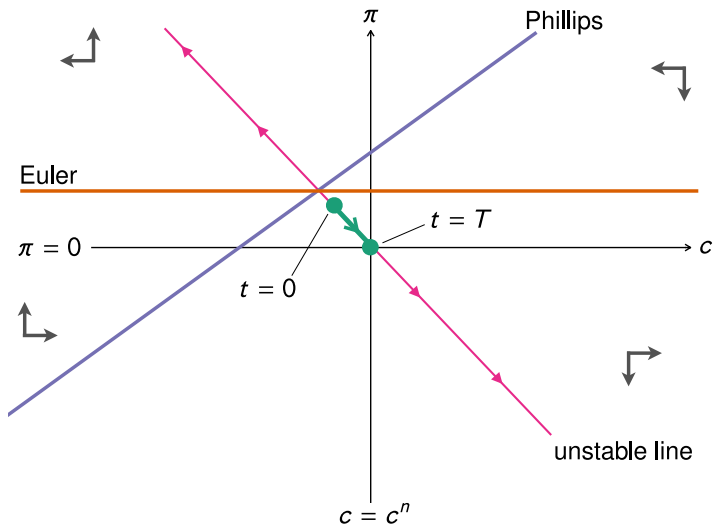
NK | ZLB + NO SPENDING



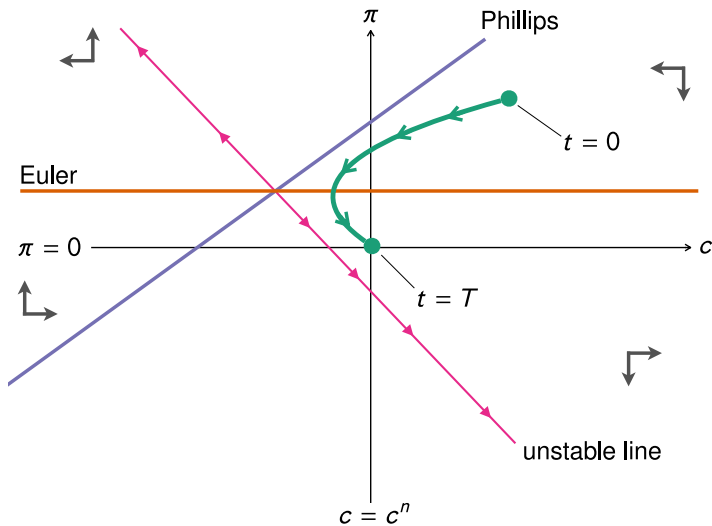
NK | ZLB + SMALL SPENDING



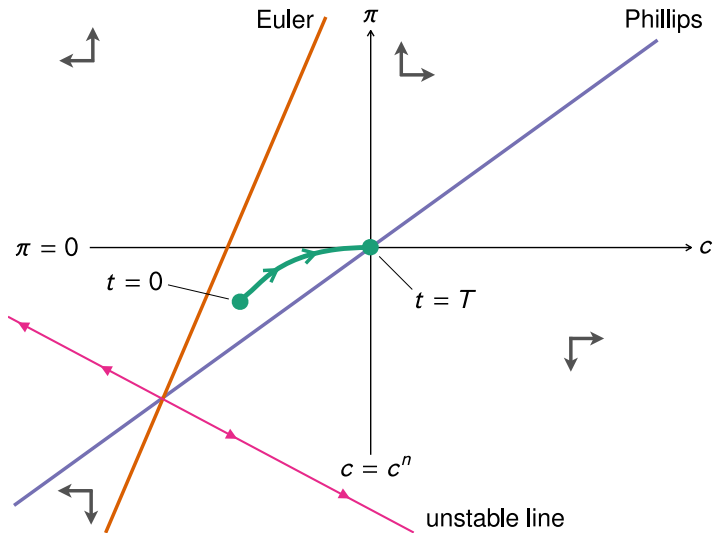
NK | ZLB + MEDIUM SPENDING



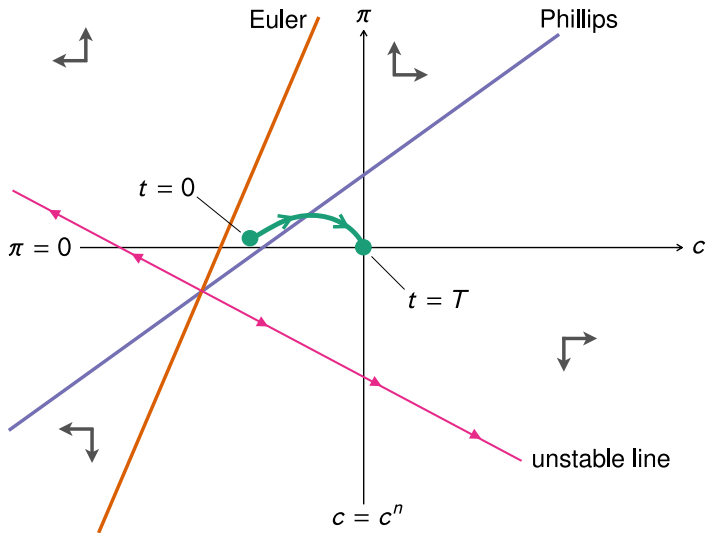
NK | ZLB + LARGE SPENDING: BOOM AT ZLB



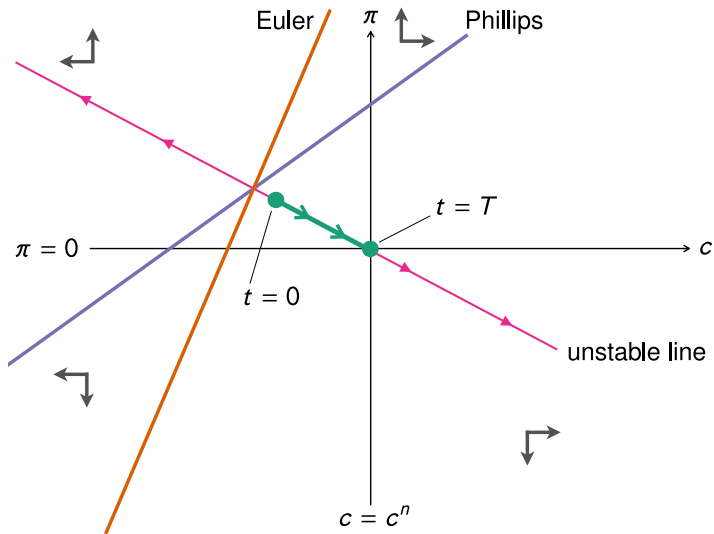
WUNK | ZLB + NO SPENDING



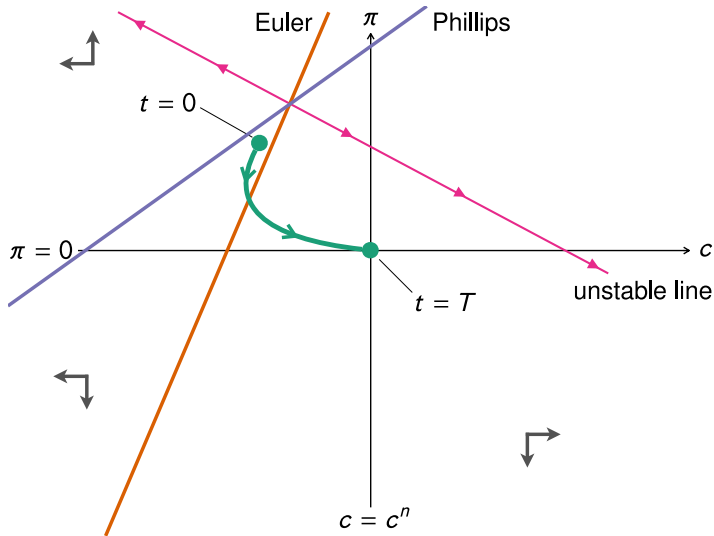
WUNK | ZLB + SMALL SPENDING



WUNK | ZLB + MEDIUM SPENDING

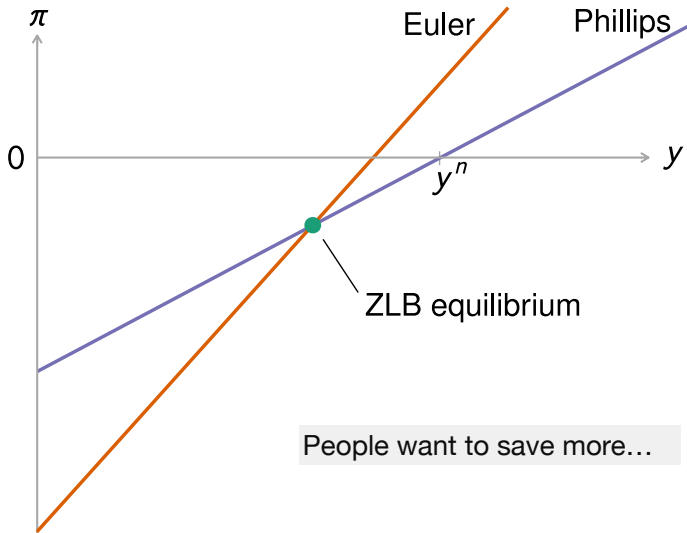


WUNK | ZLB + LARGE SPENDING: LIMITED EFFECT

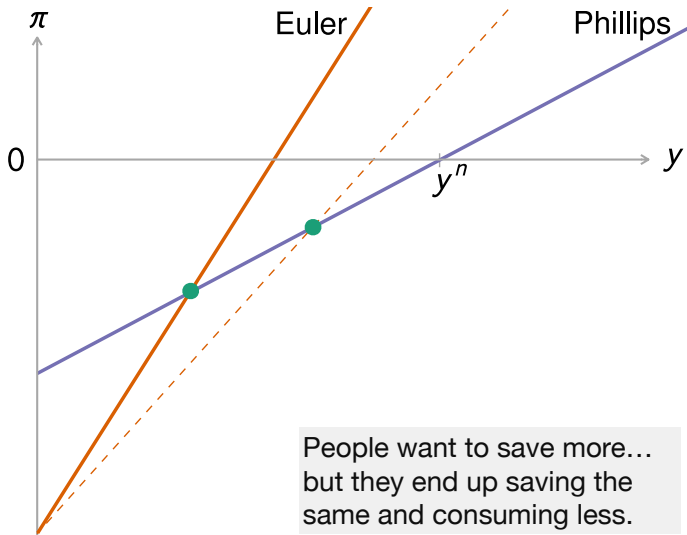


OTHER ZLB PROPERTIES IN WUNK

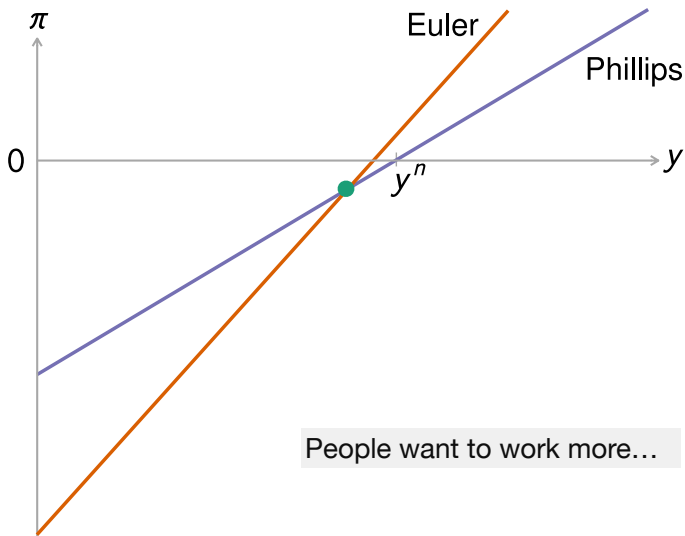
PARADOX OF THRIFT: HIGHER MU OF WEALTH



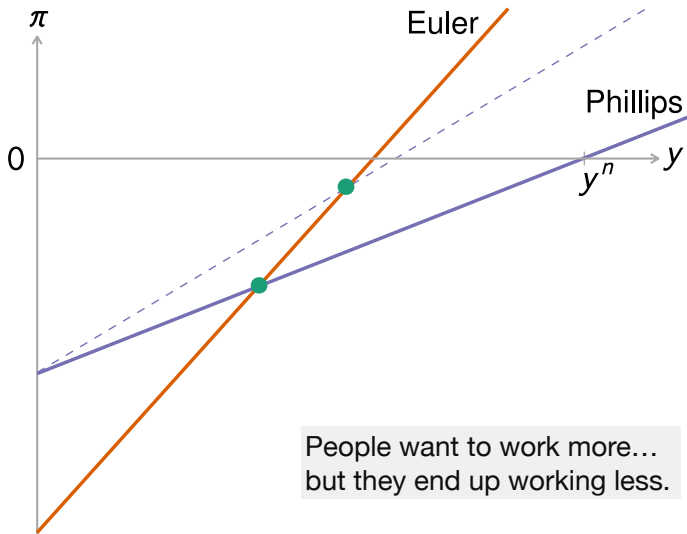
PARADOX OF THRIFT: HIGHER MU OF WEALTH



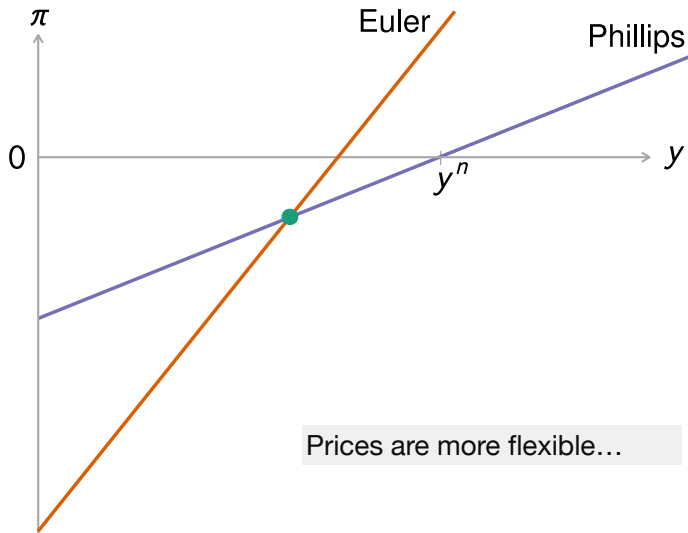
PARADOX OF TOIL: LOWER DISUTILITY OF LABOR



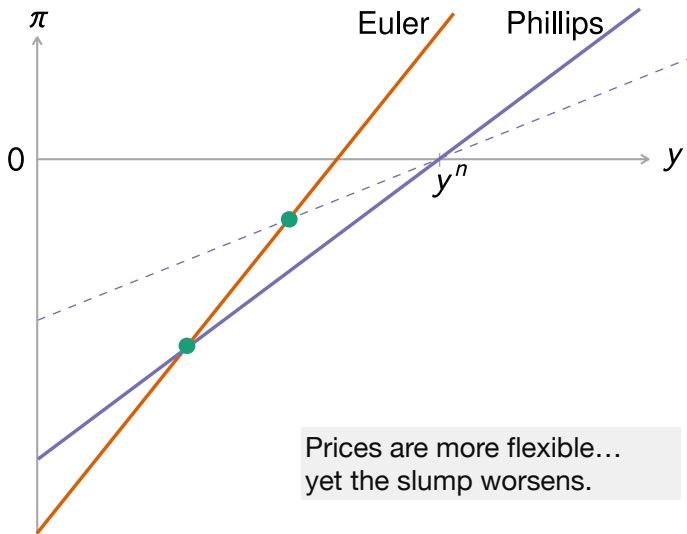
PARADOX OF TOIL: LOWER DISUTILITY OF LABOR



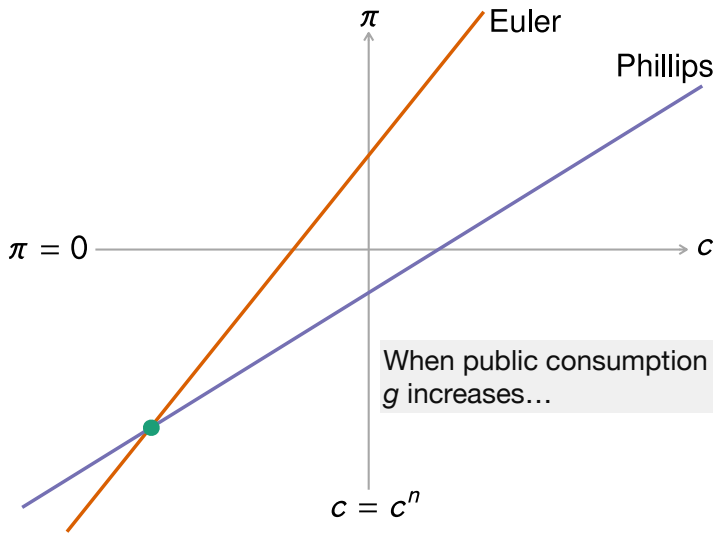
PARADOX OF FLEXIBILITY: LOWER PRICE-ADJUSTMENT COST



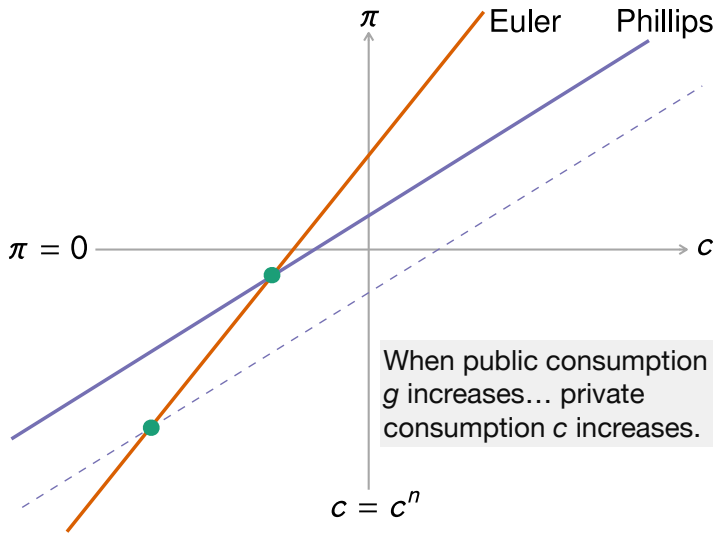
PARADOX OF FLEXIBILITY: LOWER PRICE-ADJUSTMENT COST



ABOVE-ONE GOVERNMENT-SPENDING MULTIPLIER



ABOVE-ONE GOVERNMENT-SPENDING MULTIPLIER



ASSESSMENT OF WUNK ASSUMPTION

- WUNK assumption in measurable statistics:

$$\delta - r^n > \frac{\lambda}{\delta}$$

- δ = annual time discount rate $\approx 43\%$
 - Frederick, Loewenstein, O'Donoghue [2002]
 - Andersen, Harrison, Lau, Rutstrom [2014]
- r^n = natural rate of interest $\approx 2\%$
- λ = output-gap coefficient in Phillips curve $\approx 1.6\%$
 - Mavroeidis, Plagborg-Moller, Stock [2014]
- assumption holds: $43\% - 2\% = 0.41 > 0.037 = 1.6\%/43\%$
 - lowest acceptable household discount rate: 27%
 - lowest acceptable firm discount rate: 16%